UNIVERSITY AND EDUCATIONAL INTELLIGENCE

Cambridge.—The examination for open scholarships at Christ's College will be held on Tuesday, April 9. Candidates in natural science will be required to show a satisfactory knowledge of elementary chemistry, both theoretical and practical. Candidates are required to send in their names to one of the tutors of the college before April 2. Further information can be obtained on written application to Mr. John Peile, or the Rev. J. W. Cartmell, Christ's College.

Science and Art Department.—The list has been published by the Science and Art Department of the successful candidates in honours at the examination of science schools and classes, May, 1877. We give the names of the two first in the first class of each subject:—Subject I. Practical, Plane, and Solid Geometry—John R. Smith, age 32, clerk; William J. Last, age 19, engineer. Subject II. Machine Construction and Drawing—Robert A. Sloan, age 22, engineer; William Sisson, age 24, engineer. Subject III. Building Construction—Crichton Walker, age 34, carpenter; Robert Henry, age 22, draughtsman. Subject IV. Naval Architecture—Frederick B. Ollis, age 18, shipwright's apprentice; George A. Agnew, age 23, shipwright's apprentice. Subject V. Pure Mathematics, Stages One, Two, and Three—George J. T. Harker, age 18, student; Arthur W. Ward, age 18, cotton broker. Stages Four and Five—Frederick W. Watkin, age 18, pupil; Arthur E. Holme, age 18, engineer. Subject VI. Theoretical Mechanics—William Sisson, age 24, engineer; William Martin, age 22, engineer. Subject VII. Applied Mechanics—Frank W. Dick, age 23, engineer; Fred Ogden, age 18, engineer, William J. Last, age 19, engineer, Robert A. Sloan, age 22, engineer, Robert Greenhalgh, age 22, engineer—eq. Subject VIII. Acoustics, Light, and Heat—Frederick E. Boughton, age 20, draughtsman; James Greer, age 31, Inland Revenue officer. Subject IX. Magnetism and Electricity—Robert A. Sloan, age 22, engineer, Frederick E. Boughton, age 20, draughtsman—eq.; William J. Last, 19, engineer. Subject X. Inorganic Chemistry—Charles N. Luxmore, age 19, chemist's assistant; Sidney E. Meates, age 17, chemical student. Subject XI. Organic Chemistry—Charles M. Luxmore, age 19, chemist's assistant. Subject XX. Navigation—George Goodwin, age 14, engineer's apprentice; William Allingham, age 26, clerk. Subject XXII. Steam—Robert A. Sloan, age 22, engineer, William Sisson, age 24, engineer—eq.; Alfred Cliff, age 22, engineer, Jerdan Nichols, age 21, engineer—eq. Subject XXIII. Physical Geography—John S. Harper, age 19, student in training; John Sharkey, age 29, schoolmaster. Subject XXIII. Physiography—George A. Freeman, age 26, schoolmaster; John A. Lakin, age 21, teacher, Fredk. J. Richardson, age 16, teacher—eq. Subject XXIV. Principles of Agriculture—Edward S. Chesney, age 21, student; William E. Akroyd, age 20, student. There have been no first class successes in Geology, Mineralogy, Animal Physiology, Elementary Botany, General Biology, Principles of Mining, Metallurgy, and Nautical Astronomy.

Bristol.—The annual meeting of the governors of University College was held on Friday last, when a report, on the whole satisfactory, was presented. The number of students has somewhat decreased, as indeed might have been expected, but there seems every reason to believe that the college has taken its place as an important centre of education in the west of England. The funds of the college, though considerable in amount, are yet not sufficient to keep it going with complete efficiency, and we hope the appeal made by the governors will be satisfactorily responded to. It is proposed to make the college a local centre for the examinations of the University of London.

Pesth.—A commission has recently been appointed by the various faculties, to make fitting preparations for the celebration of the first centennial of the opening of the university, which was performed by Maria Theresa in 1780. The university is wealthy, possessing property to the amount of 6,000,000 florins, and a library of 120,000 volumes, and forms the real centre of Hungarian intellectual life. The other two Hungarian universities, Klausenberg and Agram, were founded respectively in 1872 and 1874. At present the instructors number 150 and the students 2,630.

Würzburg.—Prof. Sachs has declined the call to the vacant chair of botany at the Berlin University, and the authorities are still seeking a successor for the late Prof. Braun.

SOCIETIES AND ACADEMIES

London

Royal Society, December 6.—Points of resemblance between the suprarenal bodies of the horse and dog, and certain occasional structures in the ovary, by Charles Creighton, M.B., Demonstrator of Anatomy, Cambridge University. Communicated by Prof. Humphry, F.R.S.

On the tides at Malta, by Sir G. B. Airy, K.C.B., Astronomer-Royal.

Observations on hermetically-sealed flasks opened on the Alps, in a letter to Prof. Huxley, Sec. R.S., by Prof. Tyndall, LL.D., F.R.S. Though the author believes the question of "Spontaneous Generation" is practically set at rest for the scientific world, he has been making some experiments on *Bacteria*.

He took with him this year to the Alps sixty hermetically-sealed flasks, containing infusions of beef, mutton, turnip, and cucumber, which had been boiled for five minutes and sealed during ebullition. These were kept for six weeks, when some were opened in a hay-loft and others on the edge of a precipice.

The two groups of flasks were then placed in the author's kitchen, where the temperature varied from about 65° to 90° Fahr. The result was that twenty-one of twenty-three flasks opened in the hay-loft were filled with organism; two of them remained clear. All the flasks opened on the edge of the precipice remained as clear as distilled water. Not one of them gave way.

Chemical Society, December 6.—The President in the chair.—The following papers were read:—On gallium, by W. Odling. The properties of the metal, its chloride, and sulphate, and their reactions, were given and specimens exhibited.—On nitrification, a report of experiments conducted in the Rothamsted Laboratory, by R. Warrington. Schloesing and Müntz have shown that nitrification is due to the action of an organised ferment whose action is suspended by chloroform. The author has completely confirmed the above statement, and has proved that carbolic acid and bisulphide of carbon also stop the action of the ferment, and moreover that darkness is essential for the process. The author has succeeded in converting a dilute solution of ammonium chloride into a nitrate by seeding it with some earth from a fairy ring and keeping it in the dark for three months.—On potable waters, by E. J. Mills, D.Sc. The author investigates the minute errors incidental to the process of Frankland and Armstrong with great care, suggests a new form of evaporator, and arrives at three natural constants or ratios of organic carbon to organic nitrogen in potable waters.—On some derivatives of allylacetone, by J. R. Crow. By the action of sodium, a secondary alcohol homologous with allyl alcohol was prepared; its acetate and dibromide were also investigated.—On a fourth method for estimating bismuth volumetrically, by M. M. P. Muir. The bismuth is precipitated as oxalate, the latter on boiling is converted into a basic oxalate, the precipitate is well washed, dissolved in hydrochloric acid, and the solution titrated with permanganate.—On the gas of the Grotto del Cane, by T. G. Young. This gas contains 61–71 per cent. of carbonic acid, the residual air having the composition oxygen, 20·25, nitrogen, 79·75.—Note on tetrabromide of tin, by T. Carnelly, D.Sc., and L. T. O'Shea. This body was obtained as a colourless liquid, solidifying to a mass of colourless crystals,—melts at 30° C., boils at 201°.

Meteorological Society, November 21.—Mr. H. S. Eaton, M.A., president, in the chair.—The following gentlemen were elected Fellows of the Society, viz.:—E. D. Archibald, B.A., R. W. P. Birch, Capt. W. F. Caborne, H. Clarke, L.R.C.P., Cohen de Lissa, F.S.S., R. Gordon, J. Hunter, jun., J. J. Lake, Rev. E. A. D. O'Gara, O.S.B., R. Pennington, LL.B., E. E. Prichard, and Rev. S. J. W. Sanders.—The following papers were read:—On the general character and principal sources of variation in the weather at any part of a cyclone or anti-cyclone, by the Hon. Ralph Abercromby, F.M.S. In a cyclone the broadest feature of the weather, as seen on a synoptic chart, is an area of rain about the centre surrounded by a ring of cloud, beyond which the sky is clear. The precise form and position of these areas vary with the type of pressure distribution, with the intensity of the cyclone, and with the rate of its progress; they are also influenced by local, diurnal, and seasonal variations, the general sphere of each of which is indicated. By recording the appearance to a single observer of any part of a cyclone as it passes over him, it is discovered that the area of rain and cloud-ring may be divided into two portions—the front and the rear—differing in physical appearance and general character of the weather by a line drawn through the centre, in front of which the barometer is falling and in rear of which it is rising. Details are given and it is shown that this character remains constant whatever changes the variations above mentioned may effect. In anti-cyclones synoptic charts show great irregularity in the positions of cloud, &c., owing to local, diurnal, and other variations, but to a single observer, who considers the surroundings and physical appearance, a certain general character can be discovered in every part. A marked contrast is shown to exist between the diurnal variation of the weather in a cyclone or anti-cyclone, and a probable connection is pointed out between the diurnal variation of the weather and the diurnal variation of the barometer.—On a remarkable barometric oscillation on January 30, 1876, by Robert H. Scott, F.R.S. At 8 A.M. a remarkable dip appeared in the barometric curve for Armagh. The total amount of reduction of pressure was ·097 inch in 25 minutes and for a portion of the time, from 8·5 to 8·10, the fall was ·058 inch, being at the rate of ·697 inch per hour. On looking to the other barograms, it was found that while a very similar oscillation of slightly greater amplitude, ·102 inch, appeared at Aberdeen at noon, almost exactly four hours subsequent to the occurrence at Armagh, hardly a trace of disturbance could be detected in the barogram for Glasgow, and yet the last-named observatory lies almost on the direct line between Armagh and Aberdeen. The barograms for Stonyhurst and Halifax showed as little disturbance as Glasgow. At Dunecht Observatory the oscillation took place somewhat earlier and exhibited less intensity than at Aberdeen. At Bidston, however, which lies more out of the probable path of the depression than Stonyhurst, the oscillation is seemingly recorded with considerable distinctness. Temperature showed no appreciable change at Armagh, Glasgow, or Aberdeen. At the time of occurrence of the minimum a temporary change of direction and increase of velocity of the wind is recorded both at Armagh and Aberdeen.—The "arched squalls" of the neighbourhood of the trade-winds and of those regions where the monsoons blow with slight force and with interruptions, by Capt. A. Schück.

Physical Society, December 1.—Prof. G. C. Foster, president, in the chair.—Prof. Graham Bell exhibited and described the telephone before a crowded meeting of the Society, prefacing his account of the apparatus now so well known by a very complete historical sketch of the progress of electric telephony. The first experiments referred to were those of Prof. Page, who, in 1837, was studying the relation of electricity to magnetism, and found that if a coil of wire, traversed by a current, surrounds an iron rod, a sound like a pistol shot proceeds from this latter whenever the current is made or broken. He was followed by De la Rive, Poggendorff, Reiss, and others, but Reiss was the first to employ the human voice in his experiments. After pointing out that in transmitting sounds by electrical means the initial sounds themselves are in no sense transmitted but are only employed to generate currents which reproduce similar sounds, Prof. Bell proceeded to examine the phenomena which take place when sounds are transmitted through the air. It is, of course, not the motion of the vocal organs themselves that is received in the ear, but that of the air set in motion by their means, and all peculiarities in the sound must be peculiarities in the motion of that air. If the rapidity of motion varies it occasions a variation in the pitch, and the loudness is changed by changing the amplitude. The *shape* of the vibration produces timbre. If by moving the air in certain specified ways, certain vowel sounds are given out, then those same sounds will be emitted if an identical movement be occasioned by any mechanical means whatever, and Prof. Bell has found that such a motion may really be given to the air in various ways. Three classes of electrical currents have been employed for transmitting sounds to a distance, and these he denominates intermittent, pulsatory, and undulatory. The first form is obtained when a current passes for a brief interval, is then followed by an interval during which no current passes, and this by a current of the same or opposite sign. In the second class a current is continually passing, but its intensity increases and decreases instantaneously, and finally, in the third class this variation takes place gradually, and may therefore be represented by a sinuous line. In his experiments on the nature of the movement of the air Prof. Bell employed a human ear, a hay style attached to the incus recording the movement communicated to it on a moving sheet of smoked glass. A very interesting series of curves produced by this means was shown upon the screen, and he explained how his experiments in this direction led him to the present form of telephone. Since the very small membrane of the ear was capable of setting in motion comparatively large bones, it seemed probable that it could cause a light piece of iron to vibrate. In the earlier form of apparatus a piece of steel spring was therefore attached to a stretched membrane of gold-beaters' skin and placed in front of the pole of the magnet, but he found on increasing the area of metal that the action of the instrument was improved, and thus was led to do away with the membrane itself. Another branch of the investigation referred to the strength of the magnet employed, and this was modified by varying the strength of current. The battery was gradually reduced from fifty cells to none at all, and still the effects were observed, but in a much less marked degree; the action was in this latter case, doubtless, due to residual magnetism, hence, in the present form of apparatus, a permanent magnet is employed. Lastly, the effect of varying the dimensions of the coil of wire was studied, when it was found that the sounds became louder as its length was diminished; a certain length was, however, ultimately reached beyond which no improvement was effected, and it was found to be only necessary to inclose one end of the magnet in the coil of wire. A number of diagrams were projected on to the screen which showed the various forms the apparatus has taken from the time of Page to the present day. An air sung in a distant part of the building was distinctly heard in the room by the aid of an improved form of Reiss' telephone, lent by Prof. Barrett, and made by Mr. Yates, of Dublin. Prof. Bell, Prof. Foster, and Dr. Gladstone then carried on a conversation with a gentleman at a distance, and utterances were shown to be audible when the transmitting instrument was held about a foot from the mouth. A discussion then followed in which Mr. De la Rue, Dr. Gladstone, Profs. Foster, Guthrie, Atkinson, and others took part. In replying to the various questions, Prof. Bell stated that his attempts to determine the amplitude of the vibrations had not been successful, and he is coming to the conclusion that the movement must be molecular. Very distinct sounds are emitted when a considerable mass of iron is employed; and further, if the iron be glued to a piece of wood an inch thick and this be interposed between it and the magnet the action still continues. Conversation has been carried on through a distance of 258 miles, but a resistance of 60,000 ohms has been interposed without preventing the action. There is a very marked difference in the manner in which letters are reproduced by the telephone. Vowel sounds are more acceptable than consonants, and, as a rule, those letters are best transmitted which involve a large oral aperture in their utterance. Finally, he finds that high sounds are produced more fully than low ones, but this question has not yet received sufficient attention.

Zoological Society, December 4.—Prof. Newton, F.R.S., vice-president, in the chair.—Mr. Henry Seebohm, F.Z.S., exhibited and made remarks upon some of the rarer eggs and birds which he had obtained during his recent visit to the Arctic regions of the Yen-e-sey, in Eastern Siberia, and gave a rapid sketch of his journey. Some of the skins were interesting from the fact that they extended our knowledge of geographical distribution, such as *Phylloscopus trochilus* and *Acrocephalus schœnobænus*, from long. 88° E., *Anthus gustavi* of Swinhoe (*A. seebohmi* of Dresser, and *A. batchianensis* of Gray) from the same longitude, and young in first plumage of this species.—Mr. Saville Kent, F.Z.S., exhibited the plans of a Zoological Station and Museum and Institute of Pisciculture to be established at St. Helier's, Jersey. The object sought in the establishment of this institution was the provision within British waters of facilities for pursuing marine biological investigations similar to those which exist at the Zoological Station of Naples, and at the Andersen School of Natural History at Penikese Island, Buzzards Bay, U.S.A.—The Secretary exhibited, on the part of Mr. Andrew Anderson, F.Z.S., some specimens of natural history collected in India, amongst which were chicks of *Rhynchops* and specimens of *Podiceps cristatus* obtained breeding in North-Western India.—A communication was read from Mr. Henry Lee, F.Z.S., containing an account of the capture of a Risso's grampus at Sidlesham, near Chichester.—Mr. A. G. Butler read a paper in which he gave an account of a collection of lepidoptera made in Northern Formosa by Mr. H. E. Hobson.—A communication was read from the Marquis of Tweeddale, F.R.S., containing an account of a collection of birds made by Mr. A. H. Everett in the Island of Mindanao, Philippines. Eight new species were found in this collection, and were named *Tanygnathus everetti*, *Mulleripicus fuliginosus*, *Penelopides affinis*, *Criniger everetti*, *Orthotomus nigriceps*, *Æthopyga bella*, *Anthothreptus griseigularis* and *Ptilopus incognitus*.

Geological Society, November 21.—John Evans, F.R.S., vice-president, in the chair.—Oswald Fitch, John Hadkinson, B. Holgate, H. F. Parsons, M.D., and Edgar P. Rathbone, were elected Fellows of the Society.—The following communications were read:—On the glacial deposits of West Cheshire, together with lists of the fauna found in the drift of Cheshire and adjoining counties, by W. Shone, F.G.S.—The chair was then taken by Warington W. Smyth, F.R.S.—The Moffat series, by C. Lapworth, F.G.S.

Victoria (Philosophical) Institute, December 3.—Mr. C. Brooke, M.D., F.R.S., in the chair. The paper of the evening was read by Mr. J. E. Howard, F.R.S., and referred to the advances that modern science had made in regard to nature, and the value of "a slow but sure path of induction."

Paris

Academy of Sciences, December 3.—M. Peligot in the chair:—The following papers were read:—On artificial production of corundum, ruby, and different crystallised silicates, by MM. Fremy and Feil. In a crucible of refractory earth is put a mixture of equal weights of alumina and minium, and calcined for some time at a bright red heat; after cooling there are found two layers, one vitreous, formed chiefly of silicate of lead, the other crystalline and often presenting geodes full of beautiful crystals of alumina. To obtain the red colour of ruby, about 2 to 3 per cent. of bichromate of potash is added to the mixture of alumina and minium. The silicate of lead on the ruby crystals is removed by the action of fused oxide of lead, hydrofluoric acid, or otherwise. A silicate of alumina (apparently dysthene) is produced by heating for some time a mixture of equal weights of silicon and fluoride of aluminium (fluoride of silicon is disengaged). Other reactions with fluorides giving crystalline bodies are described.—On invariants, by Prof. Sylvester.—On various means of accelerating the service in navigation-locks, by M. de Caligny.—Sir William Thomson was elected foreign associate, in room of the late von Baer, receiving twenty-seven votes against twenty-five for M. Van Beneden.—Report on a memoir of M. Hautefeuille, on reproduction of albite and orthose. M. Hautefeuille's process consists in keeping the elements of these minerals (free or combined), in presence of certain fused salts, such as tungstic acid and the alkaline tungstates. Thus a mixture of silica and alumina, in presence of an acid tungstate of potash at a temperature between 900° and 1,000° produces tridymite, orthose, and triclinic felspars. If the elements have been exactly proportioned, the tridymite and felspar disappear, and their elements go to increase the crystals of orthose.—On the law of absorption of radiations through bodies, and its use in quantitative spectrum analysis (first part), by M. Govi. This relates to a comparison of the curves of absorption given by wedge-shaped forms of the absorbent substance.—Practical tracing of the circle which has to be substituted for a given curve of finite extent, by M. Lécomté.—Battery in which carbon is the electrode attacked, by M. Jablochkoff. Into fused nitrate of potash or nitrate of soda is placed, as the attackable electrode, ordinary coke, and as the unattackable, platina. The electromotive force varies between two and three units, and thus exceeds that of the Bunsen and Grenet batteries. The coke may be lit and put in the nitrate in a powdered state. The gases developed by the battery are utilised. The containing vessels are of iron (that for the carbon, of iron wire).—Action of oxalic acid on silicate of soda, hydrated quartz, by M. Monier.—On M. Allaire's new method of purification of fatty water of surface-condensers, by M. Hetet.—On the respiration of submerged aquatic plants, by M. Barthelemy. These plants, observed in the normal state, do not liberate gas, even in sunlight, any more than aquatic animals (the liberation observed hitherto has been caused by experiment). The true respiratory act of these plants consists in absorption of air in solution in the water, probably by the roots.—A new one-liquid battery, by M. Jourdan. The electrodes are zinc and black-lead, the liquid an aqueous solution of sal alkali.—Occultations; graphic prediction, by M. Baills.—Observations of the spots and the rotation of Mars during the opposition of 1877, at the Rio de Janeiro Observatory, by M. Cruls. The time of rotation obtained from three values is 24h. 37m. 34s.—On a fundamental problem of geodesy; application of a general method of transformation of integrals depending on square roots (continued), by M. Callandeau.—On the rational integrals of the problem of geodesic lines, by M. Levy.—On the superficial tensions of aqueous solutions of alcohol and fatty acids, by M. Duclaux.—On some properties of boric acid, by M. Ditte. A lecture experiment is recommended, which demonstrates the liberation of heat in chemical actions. It is to add 125 grammes of water to 100 grammes of boric acid. The heat is such that an ingot of Darcet's alloy put into the mixture is fused in a few seconds.—On the formation of ultramarines and their coloration, by M. Guinet.—On the alterations of eggs, *à propos* of note by MM. Bechamp and Eustache, by M. Gayon.—On the mechanism of death produced by inoculation of anthrax in the rabbit, by M. Toussaint.—On some new mammalia of New Guinea, by M. Milne Edwards.—On compound machines, their economic produce, and the general conditions of their action, by M. de Freminville.—Process of registration and reproduction of phenomena perceived by hearing, by M. Cros (sealed packet).

Geneva

Society of Physics and Natural History, October 4.—M. Alphonse Favre has found on the Allelin Mountain, dominating the upper part of the Saas Valley near Mont Rosa, a bed of euphotide. This name is applied to a rock formed of two elements, viz., saussurite, a leaden gray mineral, and diallage, a bright green mineral, classed among amphibolites. This bed explains the origin of the erratic blocks of that substance, which are seen in numbers in the plain occupied formerly by the Rhone glacier.—Prof. Wartmann showed two apparatus based upon the properties recently recognised by him among derived currents. One is intended to determine immediately the fraction of an electric current which traverses a given conductor. The other is a current-inverser, in which the production of the extra-current is avoided, because the current always finds its passage.

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